IN THE CLAIMS

This listing of the claim will replace all prior versions and listings of claim in the present application.

Listing of Claims

1.   (previously presented) A virtualization system for controlling data transfer between a host system and a plurality of storage devices, each of the storage devices having a disk controller and a plurality of disk drives related to at least one logical volume, the virtualization system comprising:

a plurality of first ports coupled to the storage devices;

a second port coupled to the host system;

a processing circuit; and

a memory configured to store mapping information, the mapping information indicating a relationship between first volume identification information, which is used by the host system to access a virtual volume in the virtualization system, and second volume identification information for identifying a first logical volume of a first storage device of the storage devices, the mapping information being used by the processing circuit for transferring data, which are sent from the host system and are related to the first volume identification information, to the first logical volume;

wherein the virtualization system receives data, which are sent from the host system and are related to the first volume identification information, during a data transfer phase in which data stored in the first logical volume are transferred to a second logical volume of a second storage device of the storage devices, the data received during the data transfer phase are written to the second logical volume; and

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wherein, if the data transfer phase is completed, changed mapping information, instead of the mapping information, is used for transferring data, which are sent from the host system and are related to the first volume identification information, to the second logical volume, the changed mapping information indicating a relationship between the first volume identification information and third volume identification information for identifying the second logical volume and being stored in the memory.

2.   (previously presented) The virtualization system as recited in Claim 1, wherein, upon receipt of data related to the first volume identification information, the processing circuit controls data transfer of the data related to the first volume identification information to the first logical volume based on the mapping information.

3.   (previously presented) The virtualization system as recited in Claim 1, wherein the second volume identification information includes a port identification of the first storage device related to the first logical volume and a Logical Unit Number (LUN) identifying the first logical volume.

4.   (previously presented) The virtualization system as recited in Claim 1, wherein the second volume identification information includes a identification number of the first logical volume.

5.   (previously presented) The virtualization system as recited in Claim 1, wherein the memory is configured to store routing information which

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indicates a relationship of connection among the virtualization system, the storage devices, and the host system;

wherein the processing circuit, upon receipt of data from the host system or any of the storage devices, controls to send the received data to the host system or any of the storage devices according to the routing information.

Claim 6 (canceled).

7.   (previously presented) The virtualization system as recited in Claim 1, wherein, when or after the data transfer phase is completed, if a write request related to the first volume identification information is received from the host system, the processing circuit controls to send a write request, which corresponds to the write request related to the first volume identification information, to the second storage device having the second logical volume.

8.   (previously presented) The virtualization system as recited in Claim 1, wherein the processing circuit is configured to be sent the mapping information from another computer system.

9.   (previously presented) The virtualization system as recited in Claim 1, further comprising:

a third port for connection with a managing unit which is configured to control the virtualization system,

wherein the processing circuit is configured to monitor a state of connection with the storage devices connected through the plurality of first

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ports, and if a change in the connection state is detected, to notify the

managing unit of the change in the connection state.

      10.   (previously presented) A virtualization system coupled to at

least one host system and a plurality of storage devices, said storage devices

each having a plurality of disk drives related to at least one logical volume, the

virtualization system comprising:

      a plurality of first ports coupled to the storage devices;

      at least one second port coupled to the host system; and

      a first processor configured to convert first volume identification

information, which is related to a first data received from the host system and

is used to identify a virtual volume of the virtualization system, into second

volume identification information for identifying a first logical volume in a first

storage device of the storage devices according to relationship information

between the first volume identification information and the second volume

identification information, and to send the first data related to the second

volume identification information to the first storage device;

      wherein the virtualization system receives a second data, which is sent

from the host system and is related to the first volume identification

information, during a data transfer phase in which data stored in the first

logical volume are transferred to a second logical volume in a second storage

device of the storage devices, the second data is written to the second logical

volume;

      wherein, if the data transfer phase is completed, new relationship

information is referred to by the first processor for sending data received from

the host system to the second storage device, the new relationship

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information being changed from the relationship information and indicating a
relationship between the first volume identification information and third
volume identification information for identifying the second logical volume; and

wherein the first processor is configured to convert the first volume
identification information, which is related to a third data received from the
host system, into the third volume identification information according to the
new relationship information, and to send the third data related to the third
volume identification information to the second storage device.

11.   (previously presented) The virtualization system as recited in
Claim 10, wherein the second volume identification information includes a port
identification of the first storage device and a Logical Unite Number (LUN)
identifying the first logical volume.

12.   (previously presented) The virtualization system as recited in
Claim 10, further comprising:

a second processor which controls the process of transferring of data
stored in a third logical volume corresponding to another virtual volume to a
fourth logical volume, and

wherein, if the process of transferring of data stored in the third logical
volume to the fourth logical volume is completed, fourth volume identification
information, which is used to identify the another virtual volume, is related to
the fifth volume identification information for identifying the fourth logical
volume.

Claim 13 (canceled).

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14.   (previously amended) The virtualization system as recited in
Claim 10, further comprising at least one third port coupled to a managing
unit, wherein the managing unit is configured to send the relationship
information to the virtualization system.

Claim 15 (canceled).

16.   (currently amended) A method of controlling data transfer in a
virtualization system coupled to a host system and a plurality of storage
devices, the host system using first volume identification information for
accessing a virtual volume of the virtualization system, and each of the
storage devices having a plurality of disk drives and a logical volume related
to a portion of the disk drives, the method comprising:

referring to a first mapping information between the first volume
identification information for identifying the virtual volume and second volume
identification information for identifying a first logical volume of a first storage
device of the storage devices;

transferring, for a data migration of the virtual volume, data stored in
the first logical volume to a second logical volume of a second storage device
of the storage devices;

receiving data of a first write request sent from the host system during
the transferring step, the first write request including the first volume
identification information, the data of the first write request being written to the
second logical volume; and

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based upon transferring substantially all data stored in the first logical

volume to the second logical volume, referring to a second mapping

information between the first volume identification information and third

volume identification information for identifying the second logical volume so

that the virtualization system can read data requested by a first read request

from the second logical volume, the first read request being sent from the host

system and including the first volume identification information.

17.   (previously presented) The method of controlling data transfer

as recited in Claim 16, further comprising:

registering in the second mapping Information in a memory;

receiving a second write request, sent from the host system, targeted

to the virtual volume after the transferring of substantially all data stored in the

first logical volume to the second logical volume;

converting the first volume identification Information related to the

second write request into the third volume identification information based on

the second mapping information; and

transferring the converted second write request to the second logical

volume.

18.   (previously presented) The method of controlling data transfer

as recited in Claim 16, further comprising:

receiving a second write request, which is sent from the host system

and is targeted to the virtual volume; and

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based upon the transferring of substantially all data stored in the first
logical volume to the second logical volume, sending a write request c to the
second write request to the second storage device based on the second
mapping information.

19.   (currently amended) A method of controlling data transfer of a
virtualization system, which couples to a host system, a first storage device
and a second storage device, the method comprising:

transferring first data sent from the host system to a first logical volume
related to a portion of a plurality of disk drives in the first storage device after
changing first volume identification information, which is related to the first
data and is used to identify a virtual volume, into second volume identification
information for identifying the first logical volume by using a first relationship
between the first volume identification information and the second volume
identification information;

transferring substantially all data from the first logical volume to a
second logical volume related to a portion of a plurality of disk drives in the
second storage device, second data being sent from the host system during
the transferring of substantially all data from the first logical volume to the
second logical volume and being related to the first volume identification
information, the second data being written to the second logical volume; and

using a second relationship between the first volume identification
information and third volume identification information for identifying the
second logical volume instead of the first relationship, if the transferring of

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substantially all data from the first logical volume to the second logical volume
is completed; and

transferring third data sent from the host system to the second logical
volume after changing the first volume identification information, which is
related to the third data, into the third volume identification information by
using the second relationship.

20.   (previously presented) The method as recited in Claim 19,
wherein the virtual volume is related to virtual port identification information.

21.   (previously presented) The method as recited in Claim 19,
wherein the third data is related to the first volume identification information
and virtual port identification information of the virtualization system, and
wherein the transferring of the third data to the second logical volume
comprises transferring the third data related to the third volume identification
information and port identification information of the second storage device
from the virtualization system to the second logical volume.

22.   (previously presented) The method as recited in Claim 19,
wherein the first volume identification information being related to virtual port
identification information of the virtualization system.

23.   (previously presented) The method as recited in Claim 19,
wherein the first volume identification information and virtual port identification
information of the virtualization system are used to identify the virtual volume.

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24. (currently amended) A method of controlling data transfer by a virtualization system coupled to a host system and a plurality of storage devices, the host system accessing a virtual volume of the virtualization system, each of said storage devices having a plurality of disk drives and a logical volume related to a portion of the disk drives, the method comprising:

receiving a first read request related to first volume identification information from the host system, the first volume identification information being used to identify the virtual volume;

sending, based on the received first read request, a second read request related to second volume identification information to a first logical volume of a first storage device of the storage devices by using first relationship information between the first volume identification information and the second volume identification information, the second volume identification information being used to identify the first logical volume;

receiving first data requested by the second request from the first storage device;

sending the received first data to the host system;

transferring data from the first logical volume to a second logical volume of a second storage device of the storage devices, second data being sent from the host system during the transferring of data from the first logical volume to the second logical volume and being related to the first volume identification information, the second data being written to the second logical volume; and

using, for controlling a read request related to the first volume identification information, second relationship information between the first

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volume identification information and third volume identification information, which is used to identify the second logical volume, if the transferring of data from the first logical volume to the second logical volume is completed,

receiving a third request related to the first volume identification information from the host system after the transferring of data from the first logical volume to a second logical volume is completed;

sending, based on the received third request, a fourth request related to the third volume identification information to the second logical volume by using the second relationship information;

receiving third data requested by the fourth request from the second storage device; and

sending the received third data to the host system.

25.   (previously presented) The method of controlling data transfer as recited in Claim 24, wherein the transferring of data from the first logical volume to the second logical volume comprises:

receiving a command of the second relationship information from a management unit; and

storing the second relationship information based on the command.

26.   (previously presented) The method of controlling data transfer as recited in Claim 24, further comprising:

storing the second relationship information.

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27.   (previously presented)   The virtualization system as recited in Claim 1, wherein the virtual volume corresponds to a virtual port of the virtualization system.

28.   (previously presented) The virtualization system as recited in Claim 1,

wherein the mapping information indicates a relationship between first port identification information of the virtualization system, which is used by the host system to access the virtual logical volume, and second port identification information for identifying a second port of the first storage device, and

wherein, based on that the data stored in the first logical volume are transferred to the second logical volume, the changed mapping information indicates relationship between the first port identification information to a third port identification information for identifying a third port of the second storage device.

29.   (previously presented) The virtualization system as recited in Claim 10, wherein the virtual volume corresponds to a virtual port of the virtualization system.

30.   (previously presented) The virtualization system as recited in Claim 10, wherein the relationship information further indicates a relationship between first port identification information of the virtualization system, which is used by the host system to access the virtual volume, and second port

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identification information for identifying a second port of the first storage
device, and

wherein, if the data transfer phase is completed, a relationship between
the first port identification information and a third port identification information
for identifying a third port of the second storage device is referred by the first
processor.

31.   (previously presented) The method of controlling data transfer
as recited in Claim 16, wherein the virtual volume corresponds to a virtual
port of the virtualization system.

32.   (previously presented) The method of controlling data transfer
as recited in Claim 16, further comprising:

relating first port identification information of the virtualization system,
which is used by the host system for accessing the virtual volume, to second
port identification information for identifying a second port of the first storage
device, and

relating the first port identification information to a third port
identification information for identifying a third port of the second storage
device.

33.   (previously presented) The virtualization system as recited in
Claim 1, wherein the first volume identification information is a Logical Unit
Number (LUN) of the virtual volume and is related to a virtual port
identification information of the virtual volume.

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34.   (previously presented) The virtualization system as recited in Claim 1, further comprising:

the virtualization system including a switch having the first ports, the second port, the processing circuit and the memory.

35.   (previously presented) The virtualization system as recited in Claim 1, wherein the processing circuit configures to convert the first volume identification information, which is related to data received from the host system, into the third volume identification information according to the changed mapping information and to send data related to the third volume identification information to the second storage device.

36.   (previously presented) The virtualization system as recited in Claim 1, further comprising:

another processing circuit configured to convert fourth volume identification information, which is related to data received from the host system and is used to identify another virtual volume of the virtualization system, into fifth volume identification information for identifying a third logical volume of a third storage device of the storage devices according to mapping information between the fourth volume identification information and the fifth volume identification information and to send data related to the fifth volume identification information to the third storage device.

37.   (previously presented) The virtualization system as recited in Claim 10, wherein the first volume identification information is a Logical Unit

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Number (LUN) of the virtual volume and is related to a virtual port identification information of the virtual volume.

38.   (previously presented) The virtualization system as recited in Claim 10, further comprising:

the virtualization system including a switch having the first ports, the second port and the first processor.

39.   (previously presented) The virtualization system as recited in Claim 10, further comprising:

a second processor configured to convert fourth volume identification information, which is related to fourth data received from the host system and is used to identify another virtual volume of the virtualization system, into fifth volume identification information for identifying a third logical volume in a third storage device of the storage devices according to relationship information between the fourth volume identification information and the fifth volume identification information and to send the fourth data related to the fifth volume identification information to the third storage device.

40.   (previously presented) The method of controlling data transfer as recited in Claim 16, wherein the first volume identification information includes a Logical Unit Number (LUN) identifying the virtual volume and is related to a virtual port identification information of the virtualization system.

41.   (previously presented) The method of controlling data transfer as recited in Claim 16, wherein:

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the virtualization system is a switch system.

42.   (previously presented) The method of controlling data transfer as recited in Claim 16, wherein:

receiving, by the virtualization system, the first read request;

converting, by control of a first processing circuit in the virtualization system, the first volume identification information included in the first read request into the third volume identification information based on the second mapping information;

transferring, by control of the first processing circuit, the converted first read request to the second logical volume;

receiving, by the virtualization system, a second read request, which is sent from the host system or another host system and includes fourth volume identification information for identifying another virtual volume;

converting, by control of a second processing circuit in the virtualization system, the fourth volume identification information, which is related to the second read request, into fifth volume identification information for identifying a third logical volume of a third storage device of the storage devices; and

transferring, by control of the second processing circuit, the converted second read request to the third logical volume.

43.   (previously presented) The method as recited in Claim 19, wherein the first volume identification information is a Logical Unit Number (LUN) of the virtual volume and is related to a virtual port identification information of the virtual volume.

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44.   (previously presented) The method as recited in Claim 19,

wherein the virtualization system is a switch system.

45.   (previously presented) The method as recited in Claim 19,

wherein:

receiving, by the virtualization system, a first read request, which is

sent from the host system and is targeted to the virtual volume;

changing, by control of a first processing circuit in the virtualization

system, the first volume identification information of the first read request into

the third volume identification information by using the second relationship;

transferring, by control of the first processing circuit, the changed first

read request to the second logical volume;

receiving, by the virtualization system, a second read request, which is

sent from the host system or another host system and is targeted to another

virtual volume;

changing, by control of a second processing circuit in the virtualization

system, a fourth volume identification information, which is used to identify the

another virtual volume and is related to the second read request, into a fifth

volume identification information for identifying a third logical volume in a third

storage device;

transferring, by control of the second processing circuit, the changed

second read request to the third logical volume.

46   (previously presented) The method of controlling data transfer

as recited in Claim 24, wherein the first volume identification information is a

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Logical Unit Number (LUN) of the virtual volume and is related to a virtual

port identification information of the virtual volume.

47.   (previously presented) The method as recited in Claim 24,

wherein the virtualization system is a switch system.

48.   (previously presented) The method as recited in Claim 24,

wherein:

receiving, by the virtualization system, a fifth read request, which is

sent from the host system and is targeted to the virtual volume;

changing, by control of a first processing circuit in the virtualization

system, the first volume identification information related to the fifth request

into the third volume identification information by using the second

relationship information;

sending, by control of the first processing circuit, a sixth request related

to the third volume identification information to the second logical volume;

receiving, by the virtualization system, a seventh request, which is sent

from the host system or another host system and is targeted to another virtual

volume;

changing, by a second processing circuit in the virtualization system, a

fourth volume identification information, which is used to identify the another

virtual volume and is related to the seventh request, into a fifth volume

identification information for identifying a third logical volume of a third storage

device of the storage devices;

transferring, by the second processing circuit, an eighth request related

to the fifth volume identification information to the third logical volume.

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49.   (previously presented) The method as recited in Claim 1,
wherein the data received during the data transfer phase are further written to
the first logical volume.

50.   (previously presented) The method as recited in Claim 10,
wherein the second data is further written to the first logical volume.

51.   (previously presented) The method as recited in Claim 16,
wherein the data of the first write request is further written to the first logical
volume.

52.   (previously presented) The method as recited in Claim 19,
wherein the second data is further written to the first logical volume.

53.   (previously presented) The method as recited in Claim 24,
wherein the second data is further written to the first logical volume.

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